SUSTAINABLE DIGITALISATION

Ensuring a sustainable digital future for UK film and television

Hunter Vaughan & Pietari Kääpä
October 2023

This report is authored by:

Hunter Vaughan,
Minderoo Centre for Technology and Democracy,
University of Cambridge

Pietari Kääpä,
Centre for Cultural and Media Policy Studies,
University of Warwick

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FOREWORD

The film and television industry, as with all industries, should work toward mitigating the impact of the climate crisis. The question is what works.

This report from Hunter Vaughan and Pietari Kääpä brings together evidence from their extensive ongoing conversations with industry stakeholders. Their report lays out what digital practices work for environmental and social sustainability.

The answers are not easy. The film and television industry generates a significant environmental impact due to transport, energy use, and waste production. Now, factors like data processing and storage, along with technology infrastructure, contribute to the industry's environmental footprint. This report reminds us that digital is not always the answer to the question of how to make industries greener.

This report calls on industry to design frameworks for sustainable digital practices. It also argues that policymakers should put requirements and incentives in place to encourage good digital practices across the industry.

With the Hollywood strikes around artificial intelligence (AI), we see more attention on the challenges the industry will face with AI and new kinds of technologies. It is really important for industry to get this right for workers, society and the planet.

At the Minderoo Centre for Technology and Democracy, we study how digital technologies impact people, societies and the planet. We work to ensure that there is public and democratic accountability for the choices about technologies. Our research looks to build society's capacity to create a just digital future.

We hope this report will be useful to those both inside the film and television industries, and to wider stakeholders in policy and academia, in driving conversations about a sustainable and fair future that benefits all.

Prof. Gina Neff

Executive Director,
Minderoo Centre for Technology and Democracy

EXECUTIVE SUMMARY

Despite significant efforts by the industry, digital approaches to sustainability have had only modest results, and these strategies unintentionally mask profound environmental and social costs. This report presents pathways towards *sustainable digitalisation*.

Film and television studios and industry organisations have introduced sustainable production strategies over the last two decades. These changes have often focused on sustainability solutions through digital strategies including digital shooting and editing, LED lighting, and shifting to electronic documents. Digital strategies can bring creative and practical benefits, and have become central to industry efforts around environmental protocol.

Despite significant efforts by the industry, digital approaches to sustainability have had only modest results, and these strategies unintentionally mask profound environmental and social costs. The larger scale shift incurred through emerging virtual production (VP) planning will only magnify such challenges.

This report, resulting from ongoing collaboration with industry stakeholders and policy makers, focuses on the environmental and social costs of these efforts and presents pathways towards a more environmentally robust and socially fair digital transition - or what we call *sustainable digitalisation* - for the sector. Digitalisation—that is, the adoption of digital technologies and practices as a business model and practical strategy in the sector—comes with environmental and social costs.

The rise of online streaming culture has embedded film and television within a wider set of technological industries, connected devices and infrastructures – as well as their socioenvironmental ramifications.

The UK stands to play a crucial leadership role in addressing these concerns due to its global prominence as a film and TV production location and the increasing levels of investment in its creative industry capacity. It is imperative that industry and government work together to ensure this capacity building is premised on sustainable digitalisation.

Industry has demonstrated the will and foresight to pursue sustainability strategies, yet faces a new technological frontier. Sony's 2022 Memorandum, 'Comparison of GHG Emissions from Scenes of On-Location and Virtual Productions', lays out markedly lower emissions for digitalised production.[1]

However, the report acknowledges in closing: 'Expanding the scope of future studies to include the life cycle of materials such as set construction materials, the LED panel array, and the reuse of stored virtual filming locations and set pieces would be valuable.'

We invite industry and policy stakeholders to join us in developing such future studies, and lay out pathways here for expanding the scope of understanding sustainability.

As environmental preservation and social equity should no longer be seen as distinct but as tandem priorities of a sustainable future, this report aims to draw critical visibility to the environmental and social challenges of digitalisation across film and television and to promote industry-government pathways to incentivise best practices for the digital age.

1. Sony Pictures Greener World, 'Comparisons of GHG Emissions from Scenes of On-location and Virtual Production' <https://sonypicturesgreenerworld.com/sites/sonypicturesgreenerworld.com/files/2022-09/Sony%20Pictures_Virtual%20Production%20GHG%20Analysis_2022_2.pdf> [accessed 23 June 2023]

Key Recommendations

Based on the findings of the report, we recommend:

For Industry:

The film and television industry should lead on designing stringent life-cycle environmental assessments and policy frameworks on sustainable digitalisation.
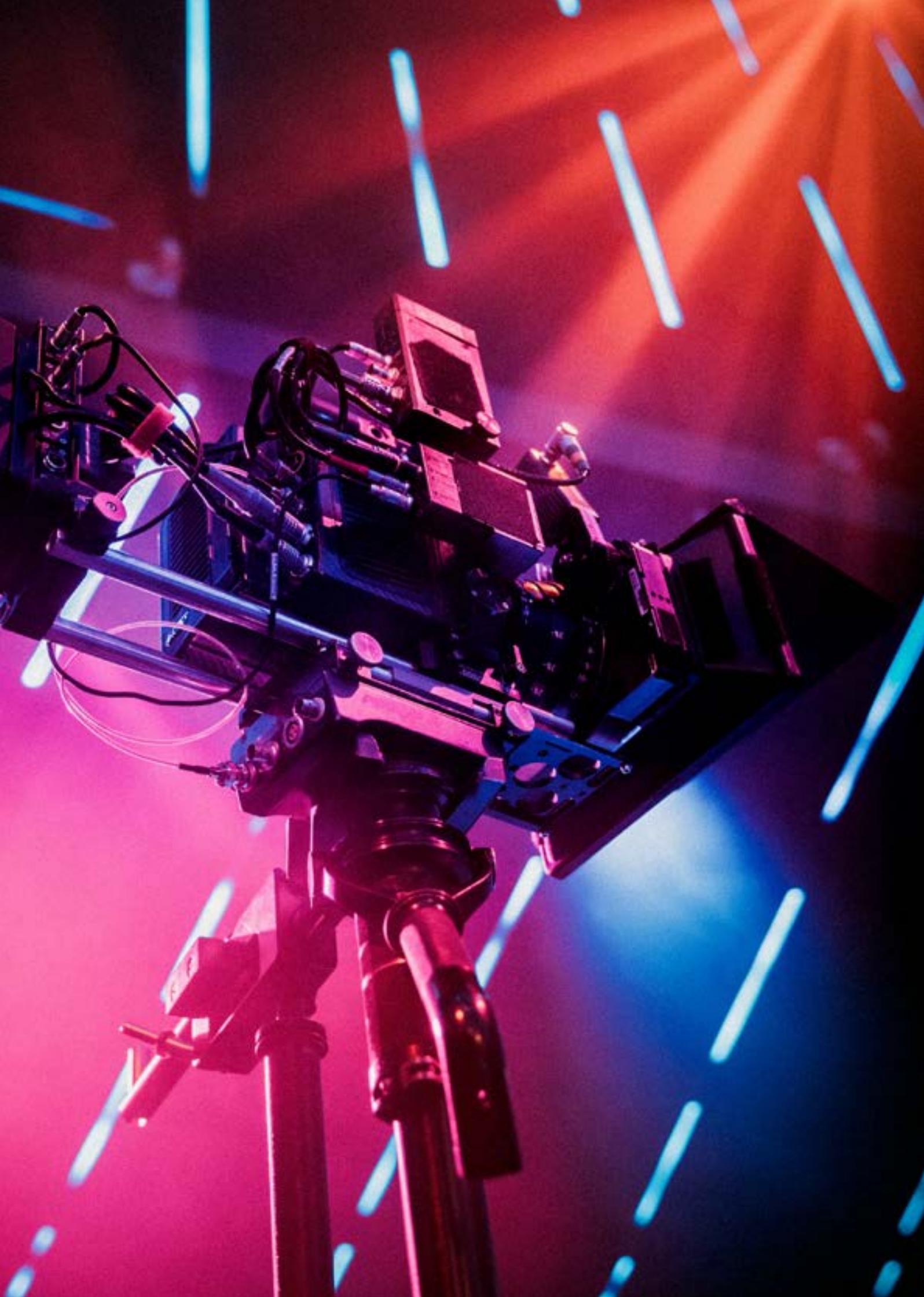

The film and television industry should develop a Charter for Sustainable Digital Work to enhance social sustainability and labour protections against the threats of increased workplace digitalisation.

For Government:

Governmental and public incentives for virtual production (VP) studios should include requirements for clean energy sources and local community impact assessments.

INTRODUCTION

This report lays out the state-of-the-art understanding of both digitalisation and sustainability across the film and television industry; identifies government and industry levers for positive change; and recommends areas for future policy action.

Film and television production leads to a significant environmental footprint due to carbon-intensive infrastructures, energy dependencies, and waste production. While the past two decades have seen a rise in stakeholder discourse around sustainability and in critical attention to the industry's environmental impacts, there is still a way to go to reach the level of impact sought.

To help identify a path forward, this report critically assesses the industry's current sustainability strategies, and advocates for more ambitious environmental and social policy development around the use of new technologies in the sector.

Digitalisation is the key battleground for these developments. On one hand, the digital transition has provided further benefits to both the corporate and individual members of the film and television industry. Online operations, non-linear (computer-based) editing and CGI effects have provided for greater efficiency in creative practice and communication.

Yet, on the other, digitalisation - from replacing paper with electronic documents to substituting analogue celluloid with digital filming, both of which can manage far more data in far smaller objects - has made it difficult to scrutinise the environmental impact of these developments.

This report builds on two underlying conclusions based upon ongoing collaborative work with industry experts in the public and private sectors:

1. *Digitalisation* carries as-of-yet under-appreciated resource costs and unexplored socioenvironmental threats; and

2. *Sustainability* as a policy and practice paradigm must be understood in terms that connect environmental protection to social inclusion and wellbeing both in the workplace and for surrounding communities adjacent to studios and on-location production sites - ie social as well as environmental sustainability.

Digitalisation—that is, the adoption of digital technologies and practices as a business model and practical strategy in the sector—has the immediate effect of streamlining communication and practice across stages of film and television production.

However, it relies on life-cycle manufacturing, operation and disposal that require widescale metal mining, vast energy dependency, and e-waste outsourcing to digital dumping grounds in lower-income nations. These processes are currently under-regulated and consequently are leading to ecosystem degradation and increased emissions of greenhouse gases (GHGs) responsible for global warming, among other harms.

Operation of largescale digital infrastructures drive energy inequity, digital dumping grounds are responsible for public health crises, and the use of AI-driven technologies have proven to embed social biases and inequalities. Consequently, a holistic approach to sustainable digitalisation must include not only environmental but also social considerations.

DIGITALISATION IN THE FILM AND TELEVISION INDUSTRY

The UK film and television industry has committed many resources to sustainability both as a practice-based goal and as a public relations strategy, yet the current approach focusing on digital practices risks limiting the effectiveness of these strategies as they miss key perspectives.

Though it is a creative industry based on storytelling, the scope of sustainable practices goes beyond what happens on the screen, and as such we encourage the industry to develop strategies that integrate workplace protections, and social responsibility recognising the need for global progress on climate action and social justice.

Doing so will require critically informed approaches to digital technologies that might pave the way for similar measures in other industries that have or are in the process of digitalising.

By most metrics, the UK film and television sector is in good health. Numbers released in June 2022 indicate promising growth, with projected 2025 total value growth of nearly 30% over 2021 and the addition of over 20,000 new jobs, largely fuelled by the 2013 HETV Tax Relief and rapid recovery from the COVID lockdown.[2]

As a global hub for high-end screen content (estimates project the UK will be the 4th largest market in the world for investment in film production by 2025[3]), the UK industry stands as a global leader. UK government's Creative Industries Sector Vision plan targets an industry expansion of £50bn and plans to support a million more industry jobs by 2030.[4]

This is therefore an important moment of transition for an industry with unique influence over local and international cultural values and social norms: how this growth takes place, in relation to sustainability protocol and new technological adaptation, stands to have formative and lasting effects within and beyond the sector.

This is also a crucial time to reposition the film and television sector as a leader in diverse national and international strategies for combatting climate change, promoting labour fairness, and issuing an energy revolution for a population in energy crisis.

The COVID-19 pandemic in many ways enabled the film and television industry to reset its approach to sustainable production.

2. Tim Dams, '21000 More Crew Needed in the UK by 2025', *Screen Daily*, https://www.screendaily.com/news/21000-more-crew-needed-in-the-uk-by-2025-says-report/5172007.article?fbclid=IwAR3c47RFPAOKwS1RDdmeu7gzLlRiuy1KUqUK1qZZYocCHBlUhPwY7WrYQ7w [accessed 12 October 2022]; K.J. Yossman, 'U.K. Film, High End TV Production Spend Forecast to Hit $9.3 Billion by 2025, further squeezing skills shortage', *Variety*, 24 June 2022 [accessed 12 October 2022]

3. Statista, 'The UK Film Industry', available at: https://www.statista.com/topics/1854/the-uk-film-industry/#topicOverview

4. Sara Neill, 'Belfast to get £75m state-of-the-art movie lab', *BBC News*, 15 June 2023 [accessed 23 June 2023] https://www.bbc.com/news/uk-northern-ireland-65916027

This reset provides an ideal opportunity to have an open and constructive discussion about the environmental impacts of film and media practice, especially concerning the role of digital services in coordinating these measures. Recent industry studies promise high levels of growth for a sector which is increasingly enmeshed in a widescale transition to digital practices and systems. Members of an expanding workforce will enter into an industry in a state of transformation, if not already transformed by a combination of new technologies and sustainability strategies.

Thus far, the green reset has involved many digital solutions, with growing financial incentivisation and creative support behind a second phase digitalisation centring around virtual production (VP). This strategy is exemplified by the industry strategy document *A Screen new deal: a Route map to sustainable production*, a collaboration between the British Film Institute, BAFTA albert, and the engineering firm Arup.

Published in spring 2020, the report provides a comprehensive analysis of the advances made in sustainable practices in the UK, from specific tools such as the BAFTA albert carbon calculator to more general development of innovative practices for waste management and studio space use. It presents a systematic vision for addressing the most pressing areas for film and television production's footprint (travel, energy and material networks) by highlighting digital infrastructures and virtual content development platforms.

Indicative of current dominant thinking in the sector, *A Screen New Deal* acknowledges potential environmental costs of full infrastructural revamping but fails to go into detail or provide adequate mitigating options.

Though promising green streamlining especially in terms of adaptable infrastructure, *A Screen New Deal* does not address the massive resource burden and GHG emissions of building these new constructs. It mentions, but does not clarify how to mitigate the profound environmental impacts of global digital infrastructure growth, operation, and maintenance.[5] It also bypasses any pressing concerns about the social equity pitfalls and racially[6] and gendered[7] discriminatory patterns of data-driven and machine-learning surveillance management[8] such as facial recognition software.

Such technologies are not currently central to the film and television workplace operations – however, with a full-scale digitalisation of production facilities and practices, they will likely become more present.

5. Naomi Klein, *On Fire: The Burning Case for a Green New Deal* (London: Penguin Books, 2020)

6. Simone Browne, *Dark Matters: On the Surveillance of Blackness* (Durham: Duke University Press, 2015).

7. Sasha Costanza-Chock, *Design Justice: Community-led Practices to Build the Worlds We Need.* (Boston: The MIT Press, 2020).

8. Shoshana Zuboff, *The Age of Surveillance Capitalism* (London: Profile books, 2018).

For the time being, *A Screen New Deal* remains a futuristic blueprint. However, Wales' national film office, Ffilm Cymru, announced in early 2023 its pilot participation in the Screen New Deal: Transformation Plan. Release news on both Ffilm Cymru's and BAFTA albert's websites indicate only that this will entail 'plans to decarbonise TV and film production'.[9]

No specifics are given regarding digitalisation, but the BFI's Research and Statistics Fund's awarding of up to £80,000 National Lottery funding to support this next stage indicates a broader commitment to *A Screen New Deal* as a guiding blueprint for future sustainability.

The film and television industry's shift to VP, signalled by Disney's use of virtual production for nearly half of *The Mandalorian* (2020-), is gaining momentum through the financial support of studios, government, and universities. Reports on the benefits of VP have been very positive regarding cost savings and decidedly selective regarding their contribution to sustainability.

Forbes, publishing an assessment by digital solutions corporation SAP, conflates digitalisation with new sustainability measures, noting that VP helps to generate costs savings by laying out the sustainability value of on-set material and corporate practices – in short, it frames cost benefits as environmental benefits.[10]
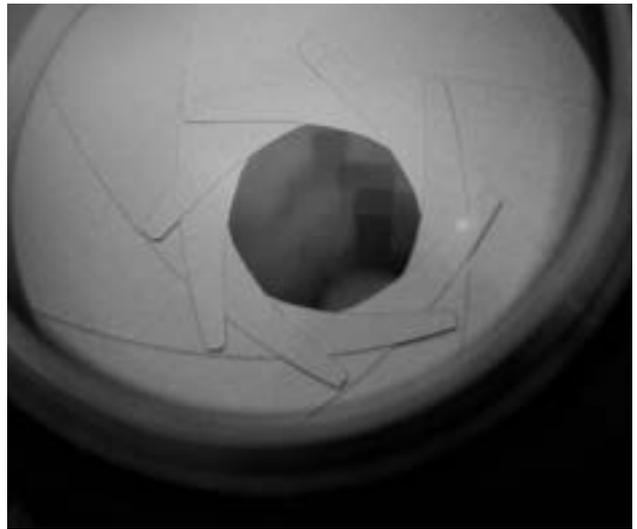
Variety has highlighted cost savings of VP and emphasised its carbon mitigation through lowering travel needs, while leaving out the greater footprint costs of VP in terms of materials and waste.[11]

The most thorough studio report on the topic, Sony's 2022 Memorandum, 'Comparison of GHG Emissions from Scenes of On-Location and Virtual Productions', lays out markedly lower emissions for VP than on-location shooting, but this is mostly linked to reduced travel and lodging for cast and crew.[12] The report acknowledges in its final paragraph: 'Expanding the scope of future studies to include the life cycle of materials such as set construction materials, the LED panel array, and the reuse of stored virtual filming locations and set pieces would be valuable. Another area to include in a future analysis is post-production.'

9. Ffilm Cymru Wales, 'BFI and albert Announce Wales to Develop Screen New Deal Production Sustainability Plan', <https://ffilmcymruwales.com/news-and-events/bfi-and-albert-announce-wales-develop-screen-new-deal-production-sustainability> [accessed 11 August, 2023].

10. Richard Whittington, 'How Film Production Is Becoming More Sustainable And Profitable', *Forbes*, 28 February, 2022. https://www.forbes.com/sites/sap/2022/02/28/how-film-production-is-becoming-more-sustainable-and-profitable/?sh=1399737f5bad [accessed 25 June 2023]

11. Jazz Tancay, 'How Virtual Production Is Helping to Cut Costs and Reduce Carbon Footprint,' *Variety*, April 20, 2022, https://variety.com/2022/artisans/news/virtual-production-small-budget-1235236717/#! [accessed 25 June 2023)

12. https://sonypicturesgreenerworld.com/sites/sonypicturesgreenerworld.com/files/2022-09/Sony%20Pictures_Virtual%20Production%20GHG%20Analysis_2022_2.pdf [accessed 23 June 2023]

The large-scale transition to VP facilities and digital practice will be accelerated by a new government programme from the UK Research and Innovation (UKRI) Convergent Screen Technologies and performance in Realtime (CoSTAR) department, funding the construction of VP movie labs at four UK sites.

These projects reflect growing commitment to VP facilities and training in film and television education, such as the Studio Ulster plan recently developed in partnership between Belfast Harbour, Ulster University and NI Screen, which will bring £75.6m of government funding and £63m of industry investment to build a lab specialising in VP techniques, computer-generated imagery (CGI), augmented reality and motion capture.[13]

Echoing the Sony report, these government-industry-education partnership plans show no indication as to environmental consideration or protocol for life-cycle material costs, operational energy demands, or end-of-life waste processes. Additionally, aside from their claims to jobs creation, they do not mention the social challenges of digitalisation either in infrastructural or workplace terms.

With the prominence of digitalisation as the future of work in the film and television arts, more diligence on environmental stringency and social protections will be helpful in ensuring more robust sustainable practices and policies that are comprehensive and holistic.

13. Sara Neill, 'Belfast to get £75m state-of-the-art movie lab', *BBC News*, 15 June 2023 [accessed 23 June 2023]
https://www.bbc.com/news/uk-northern-ireland-65916027

Policy Context

Interventions shepherded through industry-government collaboration are urgent considering persistent questions over the UK Government's climate commitments. For example, The Climate Change Committee United Kingdom (CCCUK) suggested in 2022 that: 'current government policies "will not deliver net zero" as only 8 of 50 key indicators are on track, with 11 significantly off track. No credible plans exist for 61% of required emissions cuts'[14] across all national industry – the film and television sector is no exception.

The Environmental Act of 2021 provides the sector with an opportune moment to develop specific policies in tandem with the Government's revisioning of environmental protection and energy planning.

As of yet, though, the strategy of sustainable digitalisation has not kept pace with the pressing calls of climate science. In the face of accelerating

climate destabilisation such a transition in fact expedites the already expanding practices of rare metal mining using tactics extremely detrimental to the environment.[15]

It threatens to increase infrastructural building with materials such as cement still largely unsustainable and with an alarming carbon footprint.[16] It will also deepen energy dependency on what are still largely dirty grids and heighten the generation of electronic waste that has in only a short time proven to lead to global inequities of public health and ecosystem risks.[17]

To illustrate the scale of the problem confronting any attempt to bring in more environmentally sensible legislation of the digital economy: in March 2019, the House of Lords' Communications and Digital Committee produced a report on Regulating in a digital world which called for a new approach to the regulation of technologies during this transitional moment. It concludes importantly: 'the challenge is not how to regulate digital companies, but how to regulate in the context of the changes brought about by rapid developments in digital technologies'.[18]

This could be rephrased as a problem of sustainable digitalisation. The remit of *Regulating in a digital world* focuses on the personal and legal threats of the Internet instead of its adverse environmental and societal impacts; the latter two facets need be more broadly connected to governance approaches to digital regulation.

14. Climate Change Committee, 'The 2022 Progress Report to Parliament', https://www.theccc.org.uk/publication/2022-progress-report-to-parliament/ [accessed 12 October 2022]

15. Guillaume Pitron, The Rare Metals Way (London: Scribe, 2020)

16. Nature (editorial), 'Concrete Needs to Lose Its Colossal Footprint', 28 September 2021.

17. United Nations Institute for Training and Research, 'The Global E-waste Monitor 2020', https://ewastemonitor.info/gem-2020/ [accessed 13 October 2022]

18. House of Lords, 'Regulating in a Digital World', 2019, https://publications.parliament.uk/pa/ld201719/ldselect/ldcomuni/299/29903.htm [accessed 13 October 2022]

Considering that such approaches continue to be the norm for digital policy, further work should be done to push this initiative forward according to the logic of sustainable digitalisation. To do so would require engaging key institutions and developing comprehensive strategies and norms in conjunction with government oversight bodies.

These strategies would benefit from building upon takeaways, including the recommendations explained below, from ongoing research and academic-industry and academic-governance collaborations which offer a strong foundation for potential pathways of impact.

Global Green Media Network: Potential Sites of Intervention

One such multi-level collaborative incentive is the Global Green Media Network (GGMN), launched in 2019 as an AHRC-funded network grant directed by Pietari Kääpä and Hunter Vaughan.

To now, the GGMN has entailed a series of in-person and virtual workshops with stakeholders ranging from on-set procurement specialists to green consultants, film commissioners and cinematographers, film office sustainability managers, creative executives and former Ministers for the Environment.

It has created international dialogues in the context of unique national film cultures, putting into conversation experts in digitalisation in film and television with experts in sustainable media practices.

In these multilateral conversations between practitioners and policymakers we have identified ongoing best practices and connect to policies that help cultivate understanding of needs and levers to facilitate positive change.

Major recommendations include:

Raise awareness to drive prioritisation

Sectoral stakeholders are increasingly concerned about environmental sustainability, and view digitalisation as a creative and efficiency boon, but have yet to consider the broader environmental ramifications of digital technologies.

When led to do so, they are deeply concerned; however, this is still a low priority because very few entities – mainly big budget production companies and studios in few high-income countries – have managed to fully convert creative and production processes to digital.

Broaden sustainability across procurement

Procurement (from props to craft services) and fuel remain the most prominent practical sustainability challenges. Major initiatives are in the planning, for example, for transitioning from diesel to hybrid or renewable generators. Production managers are increasingly able to employ localised green procurement channels and recycling systems.

Materialise the immaterial of post-production
Material impacts and costs are still high even as the stories we watch consist of computer graphics generated in post-production – a phase that has complex environmental costs but is only present in sustainability discussions as a technological solution, largely due to big tech discourse around the immateriality of the digital.

Include the "social" into "sustainability"
Sustainability experts position sustainability at the intersection of two important points of social discussion: social and global equity.

Social sustainability and inclusion are thought to be supported by digital systems, with remote work and meetings allowing more broadened access and providing workers less commute time and more time for family and self.

Meanwhile, digital technologies have levelled some of the playing fields of cost-based creative demand. However, little consideration has been given for the creative and collaborative obstacles of extended online-communication, though studies elsewhere conclude that remote teamwork is detrimental both to productivity and individual psychology.

Three Potential Sites of Intervention have emerged from the GGMN workshops to design and enforce more sustainable digitalisation:

Production life cycles

Production cultures

Energy futures

PRODUCTION LIFE CYCLES

With the advent of computer-generated images (CGI), computationally connected workflows and digitally equipped movie theatres, all stages of screen content production, distribution, and exhibition have slowly shifted over to digital services.

Paper memos and petrol-based studio buggies have been replaced with binary code and e-vehicles, with such substitutions splashed across PR announcements, website campaigns, and industry documents. Film and television studios have also begun to communicate their early digital transition according to the increasingly popular language of climate change-oriented corporate responsibility.

Two decades of this narrative has allowed the coupling of these story arcs – the digital turn and the green movement – from studio marketing teams to production sets.

As these narratives provided various solutions for creative development and logistical execution, such technologies have been embraced in a piecemeal fashion with no comprehensive industry regulatory oversight or policy mandates. This shift has been expedited and made more systematic by pandemic protocol and by the recent heightened predominance of streaming services that have become highly competitive content producers.

RECOMMENDATION 1:

The film and television industry should lead on designing stringent life-cycle environmental assessments and policy frameworks on sustainable digitalisation.

We recommend increased critical attention to and assessment of the supply chain and life-cycle of digital devices and processes being adopted for film and television production. Digital practices can be sustainable but are not inherently so. Studios require a vast digital network that relies on intensive rare metal mining and heightened levels of energy consumption. They produce heat in abundance in mostly urban data centres, as well as digital waste for which there is currently no proper system of management.

Accordingly, industry stakeholders should address the challenges to the sustainability of digitalisation by developing life-cycle environmental assessments of their digital systems.

Government can support, push and regulate this monitoring and reporting so that the impact of digital systems is more transparent.

These environmental assessments could include:

- Assessing initial materials for digital infrastructures and parts, using environmentally sound and fair labour-based sourcing;

- Auditing manufacturing and installation protocol to avoid unneeded construction impacts and high toxicity material use, including socioenvironmental impact audits on the selection of locations and communities affected;

- Reporting on long-term preparation and the life expectancy and durability of digital infrastructures and parts, with a focus on minimising replacement and waste.

Such large-scale infrastructural concerns require governmental coordination, including collaboration between the Office for Environmental Protection (OEP), the Communications and Digital Committee, and the Department for Culture, Media & Sport (DCMS), and Department for Science, Innovation and Technology (DSIT).

Adaptation of more stringent measures into the media sector requires specialist guidance not only from DCMS but also leading industry organisations like the British Academy of Film and Television Arts (BAFTA) and the British Film Institute (BFI), which allow for the necessary buy-in from industry on the ground.

This would potentially benefit from a joint regulatory body made up of representatives from private studios and public broadcasters, collaborating to deepen industry commitment and standardisation of sustainable practice.

A substantial part of the industry's footprint, increasingly the concern of environmental experts, relates to Scope 3 emissions, or the emissions created through the systems, energy use and emissions that make those direct practices and processes possible – which includes emissions arising from both the supply and value chain of film and television products.

Consequently, Scope 3 emissions are as significant to corporate practice in their environmental and social implications as they are elusive to research understanding and government oversight. Currently, policy and governance frameworks are confounded by the complexity of Scope 3 emissions, leading to an easy evasion of responsibility since they do not fall under direct sectoral mandates.

However, film and television sustainability reports are increasingly include some version of them, and they are of central concern to the metrics being developed for the emerging UNFCCC-backed Entertainment and Culture for Climate Action global initiative.

For Scope 3 emissions to be constructively considered, collaboration between the film industry, procurement services, government, infrastructural organisations, and interdisciplinary academic research is required to leverage multi-sectoral pressure and create awareness of the implications of procurement decisions in the supply chain.

PRODUCTION CULTURES

The production stage is a crucial testing ground for the film and television industry to facilitate an environmentally sustainable and just technological transition.

Currently, sustainability professionals are increasingly required on set and are being formalised as permanent and influential positions at studios. Many UK film offices have introduced this position as a permanent post. The UK's Production Managers Association has introduced specific emphasis on media manager training in sustainability, referencing the 2018 IPCC report and including detailed examples such as carbon mitigation and supply chain metrics.[19]

Yet, needs for shooting efficiency, prioritisation of creative mandates for getting 'the perfect shot,' and a lack of understanding or training of sustainable practices, reduces some of the potential positive impact of these positions.

Such concerns around the adoption of on-set and managerial practice need to be addressed on a systemic level, requiring the reorientation of the value systems and norms – ie. the *production culture* – of film and television organisations and operations. In many cases this has successfully been orchestrated through a top-down method, by protocol and values crafted at the executive (or producer) level. In some cases, sustainability professionals have found it productive to engage in ongoing discussion with crew and to let such values and practices evolve gradually as part of collective decision making.

Sustainable management and practice, and the place of such workers, will be crucial to shoring up best practices amidst further technological change. It also indicates the importance of social facets in broader sustainability strategies. Addressing the production culture impacts of digitalisation requires a more holistic understanding of sustainability that includes greater social inclusion and justice, and increasing planned social protections for a more digitalised workplace.

As with other environmental challenges, sustainable digitalisation across the screen industry also has profound ramifications for the social fairness and future equity of digital technologies' life-cycle labour and the creative industry workforce.

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19. See PMA's Green Wing programme: https://www.pma.org.uk/green_wing/ [accessed 13 October 2022].

Though expected to swing the pendulum slightly back towards the pre-pandemic norms of in-person work, the film and television industry generally professes an embrace of online-based (remote) work.

Current broader numbers indicate a 30% rise in hybrid and online dependency for UK work in general.[20] Yet this transition also carries with it potential dangers. With regards to the future of work, civil rights, and human wellbeing in the screen industry, Government and industry should collaborate to enhance worker access, equitable representation and labour rights. Furthermore, such concerns for social wellbeing should be integrated into mainstream narratives around a more sustainable digital future of the industry.

There remains much to be understood regarding the psychological and social ramifications of virtual interaction and how this work format might impact creativity and productivity. Despite post-pandemic normalisation of the Zoom-based workplace, recent studies challenge the long-term benefits

with regards to creative thinking and constructive problem solving.[21] Similarly, the creative and sociological impacts of virtual production have yet to be tested, though early celebrations of the connectivity of virtual life 2.0 were quickly overridden by studies of their anti-socialising and negative psychological effects.[22] Such studies offer much to the social sustainability for a future of work designed around virtual production and 'smart studio' operation.

A primary threat confirmed across a range of technology studies is the adoption of machine-learning and surveillance-based AI mechanisms such as facial recognition software.

The inter-personal and justice pitfalls of these technologies, mentioned earlier in this report, do not feature in film and television industry discussions on achieving a more sustainable approach to production in the digital age. Such decision-making algorithms and models are themselves operating within and according to existing structural inequalities along lines of race, gender, and sexuality.

Before deploying such systems as an unquestioned part of their sustainability efforts, industry should test and verify justice protections concerned with such technologies, resisting their integration until such threats are eradicated.

Government and industry should assist this process by partnering to support research and regulation surrounding the social biases and inequalities perpetuated by these devices and systems.

20. ONS, 'Is Hybrid Working Here to Stay', 2022, https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/ishybridworkingheretostay/2022-05-23 [accessed 13 October 2022]

21. G.M. Fauville, A.C.M. Luo, J.N. Queiroz, J. Bailenson, 'Zoom Exhaustion & Fatigue Scale', *Computers in Human Behavior Reports*, Volume 4, August–December 2021; M. Deniz, Seydi Engin, Ahmet Satici, Ceymi Doenyas and Mark Griffiths 'Zoom Fatigue, Psychological Distress, Life Satisfaction, and Academic Well-being', *Cyberpsychology, Behavior, and Social Networking*, Vol. 25, No. 5. 2022.

22. S. Turkle, *Life on the Screen: Identity in the Age of the Internet* (New York: Basic Books, 1995); *Alone Together* (New York: Basic Books, 2011)

RECOMMENDATION 2:

The film and television industry should develop a Charter for Sustainable Digital Work to enhance social sustainability and labour protections against the threats of increased workplace digitalisation.

We recommend the development of a *Charter for Sustainable Digital Work* to combat the potential threats posed by digitalisation across the sector. Such a document would assist industry stakeholders in pursuing social sustainability as a necessary companion to environmental sustainability.

A Charter for Sustainable Digital Work should address five key principles:

1. Equal demographic representation in the technological skill training and executive hiring of a digital workforce;

2. Intentional deployment of digitalisation for the social benefits and accessibility of workforce members (such as remote meetings to minimise transport and maximise time with family);

3. Community assessment to guarantee that the construction, use, and pollutants of digital infrastructures in studios and on location do not disproportionately harm already-marginalised neighbourhoods and communities;

4. Industry taskforce for critical inquiry into digital machine-learning and AI systems and requirement of basic standards for their non-prejudicial social operation;

5. Life-cycle assessment to minimise global contracting of digital technologies that rely on unethical labour practices and environmental destruction.

Questions of an environmentally sustainable creative industry future cannot be disconnected from its adjacent future social sustainability.

Thus, considering the justice fault lines of digitally mechanised monitoring, decision-making and community impacts is essential for developing a path toward environmental and social sustainability and wellbeing.

As many of the daily actions and decisions enacted in the digitalised workplace will be executed by human workers, they will be largely dependent on the norms and protocol of their respective production culture. Expediting the systemic normalisation of green practice should be supported by policy expansion for socially equitable education, training, and placement with a growing industry green workforce.

ENERGY FUTURES

A large part of the film and television industry's environmental impact – and potential socioenvironmental benefits – lies in its increasing energy use.

Further digitalisation will only exacerbate this problem as this sector's content circulatory system extends across data centres, subsea cable networks, affects houses, and directly into the homes of streaming audiences. Over the past decade many scholars, policymakers and industry stakeholders have acknowledged the rapidly growing energy stake of digital screen media technologies.[23]

While such devices are used to run a number of different applications, social media and entertainment platforms, there is no question that a sizeable piece of this pie comes through the streaming of film and television content.[24] Industry leaders such as Netflix claim to combat such concerns with net zero campaigns and carbon offset plans while the sector largely shifts the blame to audience demand and pushes accountability onto the shoulders of individual consumers.[25]

Instead of relying on strategies such as offsets, industry and Government should collaborate to generate concrete solutions to mitigate the environmental impacts of the supply side of content production and distribution. With regards to energy dependency and use, this could entail legally binding standards for sustainable production and international protocols for ensuring digital communication infrastructure.[26] Furthermore, organised industry strategies around energy could offer benefits for the support of renewable energy infrastructure and capacity growth and repurposing of heat generated through this power use.

New initiatives, such as the Grid Project, demonstrate the ability of public and private sector stakeholders to work towards such ends. Led by Film London, with funding from the Mayor's Good Growth Fund supported through the London Economic Action Partnership, NBCUniversal, Interreg Europe's Green Screen and the British Film Commission, the Grid Project provides a pilot study to supply renewable energy to on-location productions in the nation's capital.[27]

This project will offer an open-source scalable blueprint to be reproduced at other locations nationally and internationally, providing a model for localised renewable energy support and setting the UK industry up as a global leader in sustainable adaptation to new technologies.

23. See J. Gabrys, *Digital Rubbish: A Natural History of Electronics* (Ann Arbor: University of Michigan Press, 2011); J. Walker and N. Starosielski (eds.) *Sustainable Media* (New York: Routledge, 2015); P. Kääpä & H. Vaughan, (eds.) *Film and Television Production in the Era of Climate Change: Environmental Practice, Policy, and Scholarship,* (Basingstoke: Palgrave, 2022).

24. S. Cubitt, *Finite Media: Environmental Implications of Digital Technologies* (Durham: Duke University Press, 2017); Carbon Trust, 'Carbon Impact of Video Streaming', 2021 https://prod-drupal-files.storage.googleapis.com/documents/resource/public/Carbon-impact-of-video-streaming.pdf [accessed 13 October 2022].

25. Will Bedingfield, 'We Finally Know How Bad for the Environment Your Netflix Habit Is', *Wired*, 15 March 2021, https://www.wired.co.uk/article/netflix-carbon-footprint [accessed 13 October]

26. See SDIA 'The Roadmap to Sustainable Digital Infrastructure by 2030, 2022, https://sdialliance.org/roadmap/ [accessed 13 October 2022]

27. See Film London's 12 June 2023 press release https://filmlondon.org.uk/latest/grid-project-launch [accessed 23 June 2023]

RECOMMENDATION 3:

Governmental and public incentives for virtual production (VP) studios should include requirements for clean energy sources and local community impact assessments.

We recommend greater scrutiny on the power sources fuelling energy-hungry digital systems and accelerated incentivisation for innovation of alternative energy generation and deployment.

Industry and policy decision makers should collaborate to employ filming licence allocation and fee reductions to drive reduction of fossil fuel dependency, as have proven elsewhere to be greatly successful. Public and private funding bodies should require cleaner energy use and leverage high production locales to build local renewable energy capacity.

In collaboration with Government and national-level environmental and energy oversight, industry members should conduct extensive grid analysis, or scientific assessment of the companies, origins and processes that power them, to determine the 'cleanliness' or 'dirtiness' of their energy source.

They should consequently prioritise optioning for renewable energy where possible and position new systems in locations where clean energy sources are readily accessible.

Furthermore, socioenvironmental studies should be performed to select locations where energy scarcity and injustice do not disproportionately affect marginalised socioeconomic groups or add to already-existing poor health conditions and energy crisis. Industry operations should not be permitted to place undue strain on local grids that consequently expand reliance on fossil-fuel sources or inflate the price of energy to local community members.

While such collaboration should continue to be conducted with consultancies like Julie's Bicycle, Arup and Carnstone, it is vital that more understanding and critical attention is paid to the societal impacts of digital technologies instead of uniquiely prioritising efficiency metrics and cost savings.

As has been proven in highly popular locales for on-location shooting such as British Columbia, aggressive municipal policy measures and film fee incentives can successfully leverage productions to make use of local renewable and alternative energy sources as opposed to the current norm of diesel generators.[28]

Deploying the model of the Grid Project mentioned previously, positive change could be expedited in various high-interest production cities and regions by municipal and concerted national programs to convert increases

28. Vaughan, H. (2022). 'Policy Approaches to Green Film Policy: Local Solutions for a Planetary Problem', Kääpä, P. and Vaughan, H. (eds.) *Film and Television Production in the Age of Climate Crisis: Towards a Greener Screen*, London: Palgrave MacMillan 2022): pp. 43-78.

in film production permits into increased support for renewable energies.

Such actions would not only benefit the mitigation of sectoral GHG emissions but also provide for local renewable capacity building to local grids, drive green measures and economic investment[29] and reduce collective and systematic fossil fuel consumption.

Meanwhile, UK producers could take note from creative engineering practices in France and elsewhere to redistribute heat generated through server operation to local services such as public pools. Such strides would make an important intervention in the energy cost crisis sweeping across the UK over the past year and which has been projected to escalate expediently into 2024.[30]

Responsible and transparent Scope 3 reportage for the film and television industry, discussed in Recommendation 1, would require industry stakeholders to provide deeper due diligence and promote greater accountability in the wider consequential world of their decision-making regarding supply vendors, logistics, and material sourcing.

It would also extend environmental and social consideration of the sector's digitalisation to the energies and emissions generated by digital technologies, including questions about the energy grid, server protocols enabling the transmission of communication and content, the devices of end-users and the industry's overall reliance on an increasingly faster, and interconnected broadband infrastructure.

29. See IRENA's report on renewable energy cost reductions 2021: IRENA 'Renewable Power Generation Costs 2021', https://www.irena.org/publications/2022/Jul/Renewable-Power-Generation-Costs-in-2021 [accessed 13 October 2022]

30. See House of Commons Library (2022), Research Briefings, available at https://commonslibrary.parliament.uk/research-briefings/cbp-9491/ [accessed 13 October 2022]

CONCLUSION

Studios, producers and broadcasters will continue to embrace the digital transition due to its operational and economic efficiencies.

That such technologies are deployed under the guise of sustainability deflects from their resource costs and potential social threats. Consequently, more must be done to ensure that digitalisation of the film and television industry is a sustainable one designed to mitigate its environmental detriment and protect the rights and wellbeing of employees and surrounding communities.

Specific strategies must be designed and enacted regarding the life cycle and on-set culture of such technologies, with critical attention paid particularly to energy use.

More substantive regulatory measures, such as supply-chain environmental metrics, critical machine learning social assessments and financially incentivised renewable energy mandates, would provide long-term benefits and important social values.

Increased research and action around connection points between the environmental and social costs of digitalisation will enhance environmental sustainability and the future of work in the sector.

In so doing, through a responsible and responsively sustainable digitalisation, the film and television sector may play a leading role in mitigating the environmental and social damages of technological change and industry growth.

ACKNOWLEDGEMENTS

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Alison Richard Building
7 West Road, Cambridge
CB3 9DT

UNIVERSITY OF
CAMBRIDGE